CLAIMS

1. A nanoparticle comprising a core particle, wherein the core particle comprises a magnetic material and a fluorescent material, and wherein the nanoparticle has a particle size less than about 1 micrometer.

2. The nanoparticle of claim 1, wherein the particle size is less than about 750 nanometers.

3. The nanoparticle of claim 1, wherein the particle size is less than about 500 nanometers.

4. The nanoparticle of claim 1, wherein the particle size is less than about 300 nanometers.

5. The nanoparticle of claim 1, wherein the particle size is ranging from about 35 nanometers to about 200 nanometers.

6. The nanoparticle of claim 1, wherein the particle size is ranging from about 80 nanometers to about 200 nanometers.

7. The nanoparticle of claim 1, wherein the magnetic material comprises a superparamagnetic, a paramagnetic or a ferromagnetic material.

8. The nanoparticle of claim 1, wherein the magnetic material comprises a metal oxide.

9. The nanoparticle of claim 8, wherein the metal oxide is selected from the group consisting of oxide of cobalt, nickel, manganese, and iron.

10. The nanoparticle of claim 8, wherein the oxide of iron is Fe_3O_4.

11. The nanoparticle of claim 8, wherein the oxide of iron is γ-Fe_2O_3.

12. The nanoparticle of claim 1, wherein the saturation magnetization of the nanoparticle is between about 5 emu/g to about 60 emu/g.

13. The nanoparticle of claim 1, wherein the fluorescent material is selected from the group consisting of a fluorescent dye, a fluorescent organo-metallic compound, an up-converting fluorescent phosphor, a down-converting fluorescent phosphor, and a fluorescent quantum dot.

14. The nanoparticle of claim 13, wherein the up-converting fluorescent material is a phosphor fluoride.

15. The nanoparticle of claim 14, wherein the phosphor fluoride has a formula of YF_3:Yb,Er.

16. The nanoparticle of claim 14, wherein the phosphor fluoride has a formula of $NaYF_4$:Yb,Er.

17. The nanoparticle of claim 13, wherein the up-converting phosphor contains molybdenum.

18. The nanoparticle of claim 13, wherein the down-converting phosphor has a formula of CaS:Eu^{3+} or $SiAlO_2$:Eu^{3+}.

19. The nanoparticle of claim 13, wherein the fluorescent quantum dot is selected from the group consisting of CdSe/CdS, ZnS/CdSe, and GaAs.

20. The nanoparticle of claim 13, wherein the fluorescent material is a fluorescent nanometer-sized particle.

21. The nanoparticle of claim 20, wherein the fluorescent nanometer-sized particle is a polymer or silica particle containing a fluorescent material.

22. The nanoparticle of claim 1, wherein the core particle comprises a magnetic particle covered by a layer of the fluorescent material .

23. The nanoparticle of claim 1, wherein the core particle comprises a fluorescent particle covered by a layer of the magnetic material.

24. The nanoparticle of claim 1, wherein the core particle comprises fluorescent particles doped with the magnetic material.

25. The nanoparticle of claim 1, wherein the core particle comprises magnetic particles doped with the fluorescent material.

26. The nanoparticle of claim 1, wherein the core particle comprises a magnetic particle, a fluorescent particle, and a material to bind the magnetic particle and the fluorescent particle together.

27. The nanoparticle of claim 26, wherein the binding material comprises SiO_2.

28. The nanoparticle of claim 1, wherein the core particle has a coating layer.

29. The nanoparticle of claim 28, wherein the coating layer comprises SiO_2.

30. The nanoparticle of claim 1, wherein the surface of the nanoparticle is modified to comprise a functional group.

31. The nanoparticle of claim 30, wherein the functional group is selected from the group consisting of –COOH, -CHO, $-NH_2$, -SH, -S-S-, an epoxy group, and a trimethoxysilyl group.

32. The nanoparticle of claim 1, which comprises a bio-molecule.

33. The nanoparticle of claim 32, wherein the bio-molecule is covalently linked to the nanoparticle.

34. The nanoparticle of claim 32, wherein the bio-molecule is selected from the group consisting of an amino acid, a peptide, a protein, a nucleoside, a nucleotide, an oligonucleotide, a nucleic acid, a vitamin, a monosaccharide, an oligosaccharide, a carbohydrate, a lipid and a complex thereof.

35. A process of preparing a nanoparticle comprising a magnetic particle coated with a phosphor fluoride, which process comprises:

a) dispersing a nanometer-sized magnetic particle and an aqueous fluoride-containing compound in de-inonized water;

b) contacting the mixture of step a) with an aqueous solution containing soluble salts of a phosphor host, an absorber/emitter pair, and a rare-earth metal chelator by stirring for a sufficient time to allow formation of a phosphor fluoride precipitate which forms a coating around the magnetic particle; and

c) heating the magnetic particle with the phosphor fluoride coating of step b) at a temperature ranging from about 300°C to about 450°C for a period of time ranging from about 1 hour to about 10 hours to obtain the phosphor fluoride coated magnetic particle that emits light in the visible wavelength range when excited by long wavelength light.

36. The process of claim 35, wherein the nanometer-sized magnetic particle and the aqueous fluoride-containing compound are dispersed in the de-inonized water by sonication.

37. The process of claim 35, further comprising coating the phosphor fluoride coated magnetic particle of step c) with a coating layer.

38. The process of claim 37, wherein the coating layer comprises SiO_2.

39. The process of claim 35, wherein the surface of the nanoparticle is modified to comprise a functional group.

40. The process of claim 39, wherein the functional group is selected from the group consisting of –COOH, -CHO, $-NH_2$, -SH, -S-S-, an epoxy group, and a trimethoxysilyl group.

41. The process of claim 35, wherein the phosphor host is selected from the group consisting of yttrium, lanthanum and gadolinium.

42. The process of claim 35, wherein the absorber is ytterbium and the emitter is selected from the group consisting of erbium, holmium, terbium and thulium.

43. The process of claim 35, wherein the rare-earth metal chelator is selected from the group consisting of ethylenediamineteraacetic acid, triethylenetetraaminhexaacetic acid, diethylenetriaminepentaacetic acid, hydroxyethylethylenediaminetriacetic acid, 1,2-diaminocyclohexanetetraacetic acid, ethylene glycol bis (b-aminoethylether) tetraacetic acid and a salt thereof.

44. The process of claim 35, wherein the aqueous fluoride-containing compound is selected from the group consisting of NaF, KF, NH_4F and HF.

45. The process of claim 35, wherein the aqueous fluoride-containing compound is contained in an aqueous solution prior to or concurrently with contacting with the aqueous solution of soluble salts of the phosphor host, the absorber/emitter pair and the rare-earth metal chelator.

46. The process of claim 35, wherein the soluble salts of the phosphor host and the absorber/emitter pair are obtained by dissolving the corresponding metal oxide in hydrochloric acid or nitric acid and subsequently removing the residual acid.

47. The process of claim 35, wherein the amount of the rare-earth metal chelator is about 0-1 times the amount of total rare-earth ions in the aqueous solution.

48. A process of preparing a nanoparticle comprising fluorescent magnetic particles coated with silica, which process comprises:

a) dispersing nanometer-sized magnetic particles and nanometer-sized fluorescent particles in an alcohol;

b) adding de-ionized water and ammonia having a concentration of 28% to the mixture of step a) at a temperature ranging from about 20°C to about 80°C; and

c) stirring the mixture of step b) after adding n-ethyl silicate (TEOS) for a period of time ranging from about 0.5 hour to about 8 hours to obtain the nanoparticle.

49. The process of claim 48, wherein the magnetic particles are selected from the group consisting of superparamagnetic, paramagnetic, and ferromagnetic nanometer-sized particles, and nanometer-sized magnetic oxide of cobalt, nickel, and manganese.

50. The process of claim 48, wherein the fluorescent particles have a formula of YF_3:Yb,Er.

51. The process of claim 48, wherein the fluorescent particles have a formula of $NaYF_4$:Yb,Er.

52. The process of claim 48, wherein the fluorescent particle is a fluorescein-doped silica particle.

53. The process of claim 48, wherein the surface of the nanoparticle is modified to contain a functional group.

54. The process of claim 53, wherein the functional group is selected from the group consisting of –COOH, -CHO, $-NH_2$, -SH, -S-S-, an epoxy group, and a trimethoxysilyl group.

55. The process of claim 48, wherein the alcohol is 3-propanol.

56. The process of claim 48, wherein the nanometer-sized magnetic particles and the nanometer-sized fluorescent particles are dispersed in the alcohol by sonication for a period of time ranging from about 0.5 hour to about 1 hour.